Abstract

Redundant Arrays of Inexpensive Disks or RAID is a popular method of improving the reliability and performance of disk storage Of various levels of RAID *mirrored* or RAID1 and *rotating parity* or RAID5 configurations have become most popular *Mirrored* or RAID1 provides best overall performance and is easier to configure but has 100 percent storage overhead for the redundancy *Rotating parity* or RAID5 on the other hand is quite inexpensive for the redundancy it provides shows impressive performance for reads and full stripe writes in normal mode but the small write performance is poor due to the read modify write cycle involved The performance drops drastically when one of the disks fails and the system enters *degraded mode* Also RAID5 is relatively difficult to configure

Typical non scientific system disk access patterns exhibit very high locality of refer ence This thesis presents the design and implementation of an *Adaptive Hierarchical RAID* array to exploit this high locality Frequently accessed data is migrated towards the top of the hierarchy and not so frequently accessed data is moved down the hierarchy thus adaptively rearranging itself to the access patterns

Previous work on Adaptive Hierarchical RAID such as HP AutoRAID has explored one part of the design space namely design of configurable storage at the SCSI level with no interaction with higher level layers like volume manager This thesis explores a different design point namely one that is centered at the volume manager layer This is important also for the reason that with fibre channel disks and SCSI 3 Storage Area Networks (SAN) no longer need a conventional controller but a modified version of a controller that is more close to a volume manager